

Application Serial No. 10/517943
Amendment and Response
Office Action dated 10/05/2006

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Amendments to the Claims:

This listing of claims will replace all prior versions and listings of claims in the application.

Listing of Claims:

1. (Currently Amended) A chip resistor having low resistance comprising: a rectangular resistor element formed of an alloy of high-~~resistant~~ resistance metal and low-~~resistant~~ resistance metal ~~into a rectangular solid~~; and connection terminal electrodes formed at ends of the resistor element;

wherein a surface of the resistor element is formed with a plating layer made of pure metal with resistance lower than that of the alloy making the resistor element, the plating layer extending continuously from one end of the resistor element to the other end of the resistor element.

2. (Original) The chip resistor having low resistance according to claim 1, wherein the alloy making the resistor element has a negative temperature coefficient of resistance.

3. (Original) The chip resistor having low resistance according to claim 1, wherein the resistor element is formed with a sectional area reducing portion, the sectional area reducing portion being filled with the plating layer.

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4. (Original) The chip resistor having low resistance according to claim 2, wherein the resistor element is formed with a sectional area reducing portion, the sectional area reducing portion being filled with the plating layer.

5. (Currently Amended) The chip resistor having low resistance according to claim 1, wherein the plating layer on the surface of the resistor element ~~is divided between the connection terminal electrodes, or~~ is narrowed at least partially between the connection terminal electrodes.

6. (Currently Amended) The chip resistor having low resistance according to claim 1, wherein the connection terminal electrodes are integrally extended from the ends of the resistor element toward a lower surface of the resistor element, the plating layer being extended onto a surface of the extended electrodes.

7. (Currently Amended) The chip resistor having low resistance according to claim 5, wherein the connection terminal electrodes are integrally extended from the ends of the resistor element toward a lower surface of the resistor element, the plating layer being extended onto a surface of the extended electrodes.

8. (Currently Amended) The chip resistor having low resistance according to claim 1, wherein metal plates serving as the connection terminal electrodes are fixed to ~~ends of the~~ a lower surface of the resistor element at the ends thereof, and wherein an insulator covers an upper surface of the resistor element together with the plating layer~~[[,]]~~ while

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also covering a portion between the connection terminal electrodes on the lower surface of the resistor element.

9. (Currently Amended) The chip resistor having low resistance according to claim 5, wherein metal plates serving as the connection terminal electrodes are fixed to ~~ends of the~~ a lower surface of the resistor element at the ends thereof, and wherein an insulator covers an upper surface of the resistor element together with the plating layer[~~[,]~~] while also covering a portion between the connection terminal electrodes on the lower surface of the resistor element.

10. (Currently Amended) The chip resistor having low resistance according to claim 1, wherein at least a ~~the~~ lower surface of the resistor element except for the ends thereof is covered by an insulator, the lower surface of the resistor element being formed with an additional metal plating layer ~~disposed at the ends non-covered by the insulator of the resistor element~~, the additional metal plating layer[~~[,]~~] serving as the connection terminal electrode of the resistor element.

11. (Currently Amended) The chip resistor having low resistance according to claim 5, wherein at least a ~~the~~ lower surface of the resistor element except for the ends thereof is covered by an insulator, the lower surface of the resistor element being formed with an additional metal plating layer ~~disposed at the ends non-covered by the insulator of the resistor element~~, the additional metal plating layer[~~[,]~~] serving as the connection terminal electrode of the resistor element.

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12. (Currently Amended) The chip resistor having low resistance according to claim 10, wherein the additional metal plating layer[[s]] formed at the ends of the lower surface have has a thickness equal to or larger than a thickness of the insulator covering the lower surface of the resistor element.

13. (Currently Amended) The chip resistor having low resistance according to claim 11, wherein the additional metal plating layer[[s]] formed at the ends of the lower surface have has a thickness equal to or larger than a thickness of the insulator covering the lower surface of the resistor element.

14. (Currently Amended) The chip resistor having low resistance according to claim 10, wherein ~~the~~an upper surface and ~~right and left~~ a pair of side surfaces of the resistor element are covered by an additional insulator.

15. (Currently Amended) The chip resistor having low resistance according to claim 11, wherein ~~the~~an upper surface and ~~right and left~~ a pair of side surfaces of the resistor element are covered by an additional insulator.

16. (Currently Amended) A method of making a chip resistor having low resistance, the chip resistor comprising a rectangular resistor element formed of an alloy of high-resistance metal and low-resistance metal, and connection terminal electrodes formed at the ends of the resistor element, wherein a surface of the resistor element is formed with a

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plating layer made of pure metal with resistance lower than that of the alloy making the resistor element, the plating layer extending continuously from one end of the resistor element to the other end of the resistor element, the method comprising the steps of:

preparing a lead frame integrally formed with a plurality of lead bars each for forming a resistor element[[s]], the preparation using an alloy plate of high-resistant resistance metal and low-resistant resistance metal;

forming a pure metal plating layer on a surface of the resistor element in each bar of the lead frame;

adjusting resistance of the resistor element in each bar of the lead frame; and

cutting the resistor element in each bar off the lead frame after an insulator for covering the resistor element is formed.

17. (Currently Amended) A method of making a chip resistor having low resistance, the chip resistor comprising a rectangular resistor element formed of an alloy of high-resistance metal and low-resistance metal, and connection terminal electrodes formed at the ends of the resistor element, wherein a surface of the resistor element is formed with a plating layer made of pure metal with resistance lower than that of the alloy making the resistor element, the plating layer extending continuously from one end of the resistor element to the other end of the resistor element, the method comprising the steps of:

preparing a laminated material metal plate by fixing a resistor element alloy plate and a connection terminal electrode metal plate to each other, the alloy plate being made of an alloy composed of high-resistant resistance metal and low-resistant resistance metal and being formed integral with corresponding to a plurality of resistor elements of a

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~~rectangular solid arranged~~, the connection terminal electrode metal plate being made of a metal having resistance lower than the alloy plate;

removing portions of the connection terminal electrode metal plate so as to leave connection terminal electrodes after a plating layer of pure metal is formed on an upper surface of the resistor element alloy plate in the laminated material metal plate, or forming a plating layer of pure metal on an upper surface of the resistor element alloy plate after portions of the connection terminal electrode metal plate in the laminated material metal plate are removed so as to leave connection terminal electrodes;

forming insulators for covering the upper surface of the alloy plate and a part of the lower surface of the connection terminal electrode metal plate other than the connection terminal electrodes; and

cutting the laminated material metal plate into the plurality of resistor elements.

18. (Currently Amended) A method of making a chip resistor having low resistance, the chip resistor comprising a rectangular resistor element formed of an alloy of high-resistance metal and low-resistance metal, and connection terminal electrodes formed at the ends of the resistor element, wherein a surface of the resistor element is formed with a plating layer made of pure metal with resistance lower than that of the alloy making the resistor element, the plating layer extending continuously from one end of the resistor element to the other end of the resistor element, the method comprising the steps of:

making a rectangular resistor element from a metal plate;

forming a pure metal plating layer on a surface of the resistor element;

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forming an insulator for covering at least a lower surface of the resistor element
at a portion other than ends thereof; and

forming an additional metal plating layer[[s]] serving as connection terminal
electrodes of the resistor element ~~at ends of~~ on the lower surface of the resistor element at
the ends thereof ~~which are non-~~ not covered by the insulator.

19. (Currently Amended) A method of making a chip resistor having low resistance, the
chip resistor comprising a rectangular resistor element formed of an alloy of high-
resistance metal and low-resistance metal, and connection terminal electrodes formed at
the ends of the resistor element, wherein a surface of the resistor element is formed with a
plating layer made of pure metal with resistance lower than that of the alloy making the
resistor element, the plating layer extending continuously from one end of the resistor
element to the other end of the resistor element, the method comprising the steps of:

making a rectangular resistor element from a metal plate;

forming a pure metal plating layer on a surface of the resistor element;

forming insulators for covering an upper surface, a lower surface, and ~~right and~~
~~left~~ a pair of side surfaces of the resistor element except for ends of the lower surface;
and

forming an additional metal plating layer serving as connection terminal
electrodes of the resistor element at the ends of the lower surface of the resistor element
~~which are non-~~ not covered by the insulator.

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20. (Currently Amended) A method of making a chip resistor having low resistance, the chip resistor comprising a rectangular resistor element formed of an alloy of high-resistance metal and low-resistance metal, and connection terminal electrodes formed at the ends of the resistor element, wherein a surface of the resistor element is formed with a plating layer made of pure metal with resistance lower than that of the alloy making the resistor element, the plating layer extending continuously from one end of the resistor element to the other end of the resistor element, the method comprising the steps of:

preparing a lead frame integrally formed with a plurality of lead bars each for making a resistor element[[s]], the preparation using a metal plate;

forming a pure metal plating layer on a surface of the resistor element in each bar of the lead frame;

forming an insulator for covering at least a lower surface of the resistor element in each bar of the lead frame except for ends of the lower surface; and

cutting off the resistor element in each lead bar from the lead frame before an additional metal plating layer[[s]] serving as connection terminal electrodes of the resistor element are formed at the ends of the lower surface of the resistor element ~~which are non-~~ not covered by the insulator, or forming an additional metal plating layer[[s]] serving as connection terminal electrodes of the resistor element in each bar at the insulator non-covering ends of the lower surface of the resistor element before the resistor element is cut off from the lead frame.